POSITION // OCTOBER 2016

UBA's key aspects to increase plastic recycling and the use of recyclates

German Environment Agency

Umwelt Bundesamt

Imprint

Publisher:
German Environment Agency
Section I 1.2
PO Box 14 06
06813 Dessau-Roßlau
Tel: +49 340-2103-0
info@umweltbundesamt.de
Internet: www.umweltbundesamt.de

/umweltbundesamt.de
/umweltbundesamt

Autoren:
III 1.1 Heidrun Moser
III 1.2 Matthias Fabian, Matthias Jung
III 1.3 Susanne Heutling, Grit Körber, Ines Oehme
III 1.4 Johanna Wurbs
III 1.5 Susann Krause
III 1.6 Daniel Kovacs, Franziska Krüger
III 2.4 Volker Weiss

Design:
Atelier Hauer + Dörfler GmbH, Berlin

Publications as a pdf:
www.umweltbundesamt.de/publikationen

Photo credits:
shutterstock

As at January 2017

ISSN 2363-8273

POSITION // OCTOBER 2016

UBA's key aspects to increase plastic recycling and the use of recyclates

Content

1 Introduction and objective

The recycling of plastic waste and the use of recyclates in new products conserve primary raw materials and, unlike the production from crude oil, save energy and reduce CO_2 emissions. Recycling (i.e. material recovery) is usually the most environmentally friendly choice among waste management processes. Consequently, material recovery from waste is at the top of the recovery options in the Circular Economy Act's waste hierarchy. Nevertheless, plastic waste in Germany is predominantly recovered for energy. The recycling of plastic waste has remained at a low level for years, even though significantly more plastics could be reclaimed in this way. The causes are varied, therefore a range of measures and tools are required aimed at the elimination of barriers and at the promotion of high-quality plastic recycling and use of recyclates. This paper presents the German Environment Agency's view as to which measures and tools should be applied.

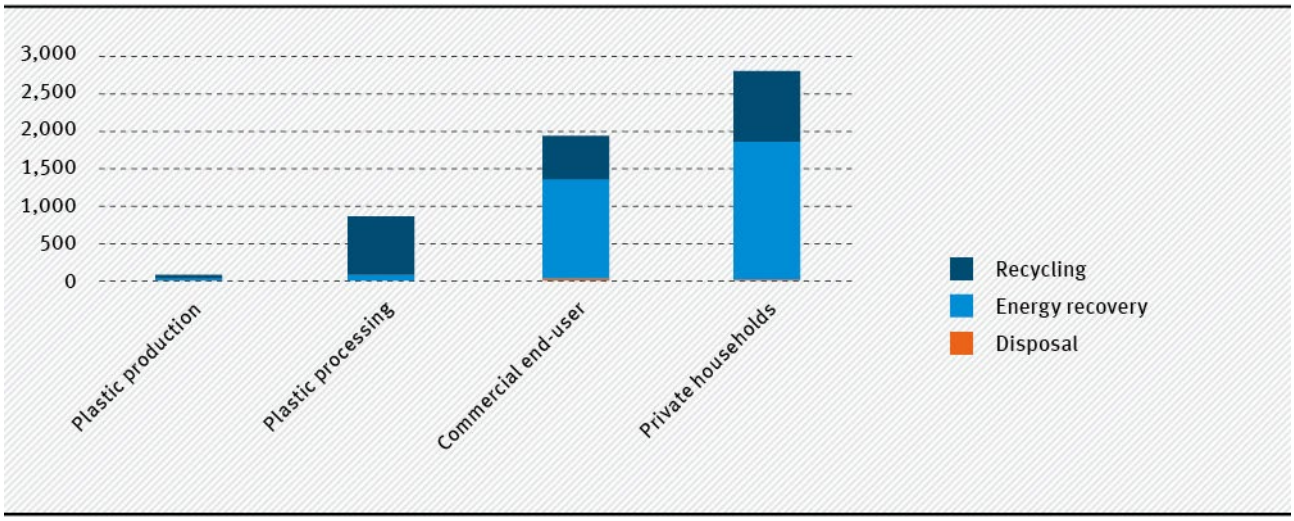
2 Starting point

2.1 Status quo of plastic recycling

In 2013, Germany generated a total of just under 5.7 million tonnes of plastic waste[1]. Of these, 41 % were recycled materially and 57 % were recovered energetically[2] (Consultic 2014). Plastic waste from plastic production and plastic processing is predominantly returned to the production process due to their disparate purity and cleanliness. Thus, recycling rates are very high at 67 % and 91 % respectively. On the other hand, product waste from private households and commercial places is recycled to a significantly lower proportion, 34 % and 30 % respectively. Among others, this can be attributed to their higher heterogeneity and greater impurity, especially in the case of non-separate collection (Consultic 2014). Figure 1 shows the status of Germany's plastic waste disposal.

Figure 1

Recycling, recovery and disposal of plastic waste by sources in Germany
(2013, data in kt)



Source: own representation based on Consultic 2014

1 This includes waste from plastic production and processing as well as product waste (at the end of the consumption phase, so-called post-consumer waste).
2 The recycled volumes also include plastic waste that was generated in Germany, but recycled abroad.

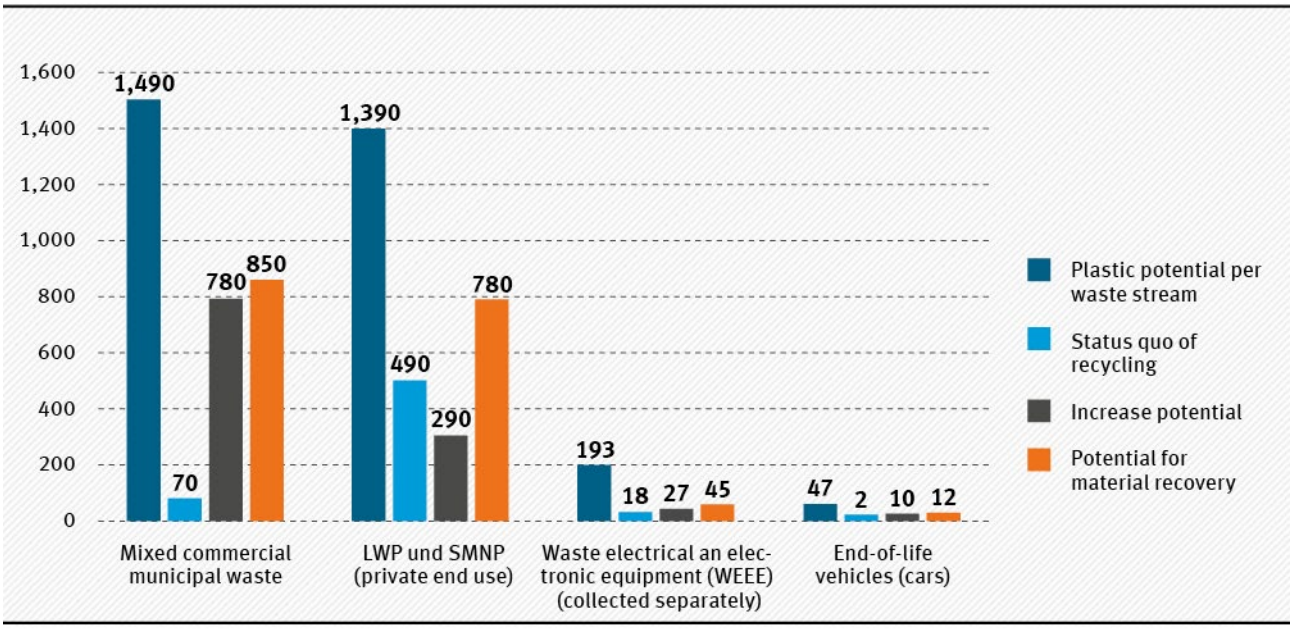
2.2 Potential for increased plastic recycling

There remains an untapped potential to increase plastics recycling particularly in the area of commercial waste, specifically in mixed commercial municipal waste[3]. In addition, the joint collection of lightweight packaging (LWP) and non-packaging of similar materials (SMNP) from private households enables a significant increase in the amount of plastics available for recycling when gathering recyclable materials (Dehoust & Christiani 2012). A little less significant, but nevertheless relevant contribution is provided by the exploitation of plastic waste from used electrical equipment and end-of-life vehicles. From the total of the aforementioned waste streams, Wilts et al. 2014 conclude that the quantity of plastic waste available for recycling could be increased by about **1.1 million tonnes** resulting in 1.7 million tonnes (see Figure 2).

In various application categories, e.g. packaging, electrical equipment or vehicles, different types of plastics are used according to specific requirements. This is also reflected in the composition of the plastic waste in these diverse waste streams. Table 1 shows the product groups and types of plastic relevant for an increase in the amount of recycled plastic from selected sources.

Figure 2

Potential for increasing the recycling of plastics from selected points of origin
(data in kt/year)



Note: Figure 2 shows the plastic potential (dark blue) compared to the amount currently mechanically recycled (light blue) from the selected points of origin. The third bar (grey) shows the amounts of plastic that could additionally be recycled as a result of implementing suitable measures and tools. Orange represents the sum of the status quo and the amounts of plastic that could potentially be mechanically recycled.

Source: own representation based on Wilts et al. 2014

3 Fundamentally, according to the current Commercial Waste Ordinance, there is an obligation to separate the waste fractions of paper, glass, plastics, metals and biowaste. However, the first four fractions can be collected together if they are subjected to pretreatment where they are sorted in largely equal amounts and material purity and are subsequently materially recycled or energetically recovered (Commercial Waste Ordinance 3(1) and (2)). In practice, however, less than half of the generated mixed commercial municipal waste is fed into a sorting installation (45 % of 5.8 million tonnes in 2010) and only a small amount of fractions is produced for recycling (Dehne et al. 2014).

Table 1

Product groups and types of plastic that are relevant in terms of quantity for increasing secondary raw material amounts

Source of plastic waste	Relevant product groups	Relevant plastic types
Mixed commercial municipal waste	Films, dimensionally stable plastics (e. g., buckets, canisters)	PE, PP
Packaging and non-packaging of similar materials from private end use	Films, dimensionally stable plastics (e. g., dishes, toys)	PE, PP
Waste electrical and electronic equipment	E. g. housing parts, covers	ABS, PP, PS
End-of-life vehicles	E. g. wheel trims, bumpers, underside shields & engine covers	ABS, PA, PP

Source: Wilts et al. 2014

We believe that waste from communal bulky waste collection has further potential. Experts estimate an annual disposal of bulky waste to be at least 2 kg/inhabitant of plastic products that could be recycled. This corresponds to an annual plastic quantity of at least 160,000 tonnes that could additionally be used for recycling (Wilts et al. 2014).

For the recovery of plastics from mixed residual waste consisting of approximately one third of plastic mixtures, a recent study by B+T Energie GmbH revealed that there is only a small available-potential for recycling (Wengenroth 2015). The tests were carried out in a pilot plant which enables informed decisions on large-scale plants with a 40-60 t/h throughput and equipped with all the sorting technologies currently available on the market. The results differentiated between 2- and 3-D plastics. In spite of considerable efforts, only 11 % of the mixed residual waste could be processed into a plastic fraction suitable for further recycling.

An illustrative consideration of plastic-enriched waste from MPS[4] and MBT[5] plants, which are usually used for producing refuse-derived fuels, also demonstrated that recyclable plastic fractions can only be separated with a high degree of technical effort and only to a small extent. This is because the majority of plastic waste contained in mixed waste had properties that often made them unsuitable for recycling. Examples include:

- Packaging with multiple layered materials (4 and more layers) cannot be adequately prepared for recycling with today's separation technology,
- Opaque PET is not recycled because markets are lacking
- Black plastics are not recognisable using today's standard sorting technologies for plastic recognition (NIRS – Near Infrared Spectroscopy) so cannot be separated from mixed waste,
- High proportion of impurities (Wengenroth 2015).

2.3 Obstacles for plastic recycling and for the use of recyclates

Inadequate waste separation and competition for energy recovery are the two most pertinent causes behind relatively small amounts of plastic waste being recycled[6]. The absence of plastic-specific recycling quotas for individual waste streams has an additional negative effect. This ultimately leads to a large proportion of the potentially recyclable plastic waste not being made available for recycling (Wilts et al. 2014).

Problematic additives can create difficulties in sales of recyclates since recycled materials from old plastics can still contain substances that are no longer permitted in new plastics due to their negative effects on health and the environment (see Section 3.3.3).

4 MPS: Mechanical Physical Stabilisation
5 MBT: Mechanical Biological Waste Treatment
6 Both of these obstacles are interdependent: energetic recovery will be the preferred option if it is economically more favourable than recycling which means that there is less separation in the waste collected, provided other objectives such as quotas are met.

Furthermore, the image problems associated with secondary plastics can distinctly hinder recyclate use in new plastic products. The reservations that manufacturers hold regarding quality and technical characteristics coupled with assumed acceptance problems on the part of the consumers can lead to the use of plastic recyclates being avoided or used predominantly in non-visible areas (for example wheel arch liners or floor components in cars) (Wilts et al. 2014).

2.3.1 SIDE NOTE: Exporting plastic waste

Exporting plastic waste means that German recycling installations lose potential input amounts. In 2014, Germany exported about 1.4 million tonnes of plastic waste. This was offset by an import of around 490,000 tonnes of plastic waste, resulting in a total export surplus of around 910,000 tonnes for 2014 (Destatis 2015).

Exporting waste for recycling is legally admissible and has been controlled since 1993 by an EU regulation which is directly applicable in the Member States and amended in 2007. The Waste Shipment Regulation (1013/2006/EU) implements the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, and the OECD Council Decision on the Control of Transboundary Movements of Wastes Destined for Recovery Operations (OECD 2001). Interfering with the global trade of plastic wastes for the purpose of strengthening plastic recycling in Germany is not conceivable. The decisive factor is that the exported plastic waste is modified in a recycling process and so becomes available as a secondary raw material. It is important that recycling in third countries also adheres to ecological and social standards that are equivalent to those in the EU. However, since the third countries are often emerging and developing countries, this is not necessarily the case and is difficult to verify. It is therefore necessary to improve the basic conditions for plastic recycling within Germany and to create an attractive market for recyclates.

3 Measures and tools to increase plastic recycling and the use of recyclates

The basic requirements for recycling are suitable and available plastic wastes on the one hand and a market for plastic recyclates on the other. There is considerable potential for improvement on both levels. Measures and tools must therefore aim to both increase the supply of mechanically recyclable plastic waste and improve demand.

3.1 Expanding the separate collection of plastic waste

3.1.1 Strict separation obligations for plastic waste

Separation obligations are the basis for high-quality recycling as a prerequisite for increased use of recyclates (mandatory for plastics according to the Packaging Ordinance (VerpackV) as well as § 14(1) of the Circular Economy Act since 2015). This avoids contamination with impurities or other pollutants which can adversely affect the plastic qualities and thus the possibility of high-quality recycling. PET beverage bottles, which are collected via the deposit system, illustrate this idea. Because PET bottles' are clean and, in this case of a high varietal purity, the final recyclates can be used in very high-quality applications – even in packaging that comes into contact with food. There is more potential for plastic recycling in the waste bins of private households, which has not yet been tapped. Therefore, we support the introduction of the joint collection of light packaging and so-called non-packaging of similar materials to group recyclable materials (e.g. through separate recycling bins). We assume that the amount of collected plastic could be increased by about 3 kg per inhabitant per year (Bünemann et al. 2011).

The commercial sector is another significant source of plastic waste. At present, a significant proportion of commercial municipal waste is collected as mixed

waste that has to this point only been partially sorted and recycled. Instead, it is often sent directly to waste incineration plants. Therefore, the separate collection of waste fractions from commercial waste owners and producers is an important prerequisite for good high-quality recycling. The current efforts to amend the Commercial Waste Ordinance are addressing this issue. The German Environment Agency in particular demands the separate collection of waste generated by the waste producer, especially the paper, paperboard and cardboard, glass, plastics, metals, wood, textiles and biowaste fractions.

3.1.2 Implementation of pre-treatment for mixed commercial municipal waste

As already described in Section 3.1.1, the separation of plastic waste at its point of origin is necessary for high-quality recycling. The currently applicable Commercial Waste Ordinance (GewAbfV) permits the mixed collection of paper, paperboard and cardboard, glass, plastics and metals. However, it must be ensured that these materials are subsequently separated in a mechanical processing plant in largely the same quantity and material purity as would be achievable in the case of a separate collection (§ 3(2) Commercial Waste Ordinance, GewAbfV). The analysis of the as-is situation within the scope of a research project showed that mixed commercial municipal waste is frequently sorted inadequately or is directly taken to waste incineration plants due to economic reasons (Dehne et al. 2011). Therefore, the amended Commercial Waste Ordinance should fundamentally incorporate a separation of waste fractions. Under certain circumstances (separation is technically not possible or economically unfeasible) the production of mixed waste will still be permissible. It is important in this case that the amended Commercial Waste Ordinance determines specific requirements for the pre-treatment of admissible mixed waste. As a priority, we call for a mechanical pre-treatment obligation for all mixed commercial municipal waste produced while adhering to the technical sorting standards. Furthermore, a sorting quota for the recyclable materials should be defined as a requirement for success monitoring and should be supplemented by the specification of the quantity introduced into the recycling process. These aspects are taken into account in the current amendment of the Commercial Waste Ordinance. The requirements refer to the total amount of recyclable materials in the mixture of waste as a whole and not to the individual fractions (such as plastics). This is due to the very heterogeneous and variable composition of mixed commercial municipal waste, which is why specific requirements are impractical. However, the quotas are formulated in such a way that all the mechanically recyclable plastics contained in the mixed waste must be separated and recycled as much as possible in order to meet the requirements.

3.2 Increasing the recycled amounts

3.2.1 Requirements for plastic recycling

Specific, legally standardised recycling targets for plastic waste only exist in the Packaging Ordinance (VerpackV[7]). Aside from that, established waste regulations for product responsibility outline recycling targets for the respective waste fractions, which only relate to the total mass of the end-of-life product. For this reason, the recycling targets are usually met through recycling of metals or other non-plastics and no further incentives are set for the extraction and recycling of plastics. Plastic-specific recycling quotas based on the Packaging Ordinance (VerpackV) can have a significantly greater effect. For this reason, we support the determination of recycling specifications for plastics in particular in the area of the End-of-Life Vehicle Ordinance (AltfahrzeugV[8]) and the Electrical and Electronic Equipment Act (ElektroG[9]).

Although the End-of-Life Vehicle Ordinance outlines a dismantling obligation for certain large plastic parts, the exception permitted by the same Ordinance is employed in most cases. As a result, the remaining vehicle bodies are shredded and the resulting material mixture is processed (so-called post-shredding process). In the majority of cases, however, it is metals that are predominantly separated. On the other hand, the recycling of plastics from this mixed fraction is difficult and expensive, which is why this is hardly ever carried out in practice. This means that a large proportion of plastics from the end-of-life vehicle sector is lost for recycling. For enhanced plastics

7 Packaging Ordinance of 21. August 1998 (BGBl. (Federal Law Gazette) I p. 2379), last amended by Article 1 of the Ordinance on 17. July 2014 (BGBl. I p. 1061).
8 End-of-Life Vehicle Ordinance in the version published on 21. June 2002 (BGBl. I p. 2214), amended by Article 95 of the Ordinance on 31. August 2015 (BGBl. I p. 1474).
9 Electrical and Electronic Equipment Act of 16. March 2005 (BGBl. I p. 762), last amended by Article 14 of the Act on 20. September 2013 (BGBl. I p. 3642).

recycling from end-of-life vehicles, we therefore call for the consequent dismantling of large plastic parts. Alternatively, the requirement could be introduced that 20 kg of plastics per end-of-life vehicle should be recovered and recycled. Regarding product responsibility, the manufacturers must assume the cost responsibility.

Recycling of plastic waste from waste electrical and electronic equipment is restricted if the plastics are contaminated with problematic flame retardants or heavy metals. Polybrominated flame retardants such as polybrominated biphenyls (PBB) and polybrominated diphenyl ethers (PBDE) are particularly critical. For health and environmental reasons, plastics containing polybrominated flame retardants must be removed during the treatment of separately collected waste electrical and electronic equipment (Annex III ElektroG). In practice, however, separation processes that allow the targeted removal of pollutant-containing plastics have not been established. According to Zangl et al. 2012, plastics from waste electrical and electronic equipment which has not been recovered by dismantling/mechanical disassemblyfor recycling go mainly to thermal waste treatment. In light of the described problems, we propose a plastic-specific recycling requirement for waste electrical and electronic equipment (WEEE) for large household appliances only. These devices have a relatively high plastic content and are also barely contaminated by flame retardants.[10] Therefore, as part of the work on the Treatment Ordinance we are considering the inclusion of an obligation to dismantle large plastic parts from large household appliances.

In addition to the establishment of recycling requirements for individual material streams, we propose the establishment of an indicator that illustrates the overall development and the achieved state of plastic recycling. The proportion of recycled plastic waste is a suitable indicator. The goal should be to recycle 50 % of all plastic waste by 2020.

3.2.2. Ambitious and self-learning recycling rates

Recycling rates are fundamentally effective drivers towards recycling. The (plastic-specific) quotas in the Packaging Ordinance (VerpackV) have led to the development of efficient sorting and recycling technologies as well as to a broad recycling infrastructure. However, the VerpackV's recycling conditions for plastics have been exceeded for years and have thus lost their steering function. Therefore, the quotas must be significantly increased. For plastic waste, it should be stipulated that 75 % of the licensed packaging materials should be supplied to mechanical recycling. This quota must be supplemented by a total recycling rate of 50 %[11] with regard to the collected amount, so that a high supply of the recyclable materials is ensured even in the case of sublicensing[12]. In order to ensure that this quota permanently maintains its steering function, recycling quotas should also be based on state-of-the-art technology and, depending on the attained recycling achievements, should be automatically increased (so-called self-learning quotas).

10 The proportion of plastics contaminated with flame retardants is 1.5 % for large electrical appliances and 60 % for ICT devices (Empa 2009 as cited in Wilts et al. 2014).
11 Added to this is the stipulation of an evolving (self-learning) minimum collection amount with a starting value of 25 kg/citizen*a.
12 Producers and distributors of sales packaging and non-packaging of similar materials that are collected in private households must have them licensed by one or more dual systems in order to finance their disposal. However, the accumulated amount often exceeds the licensed amount (e.g. due to non-compliance with the stipulations or malfunctions). Non-licensed waste can thus contribute to the fulfillment of the recycling quotas, which means that the technological possibilities for sorting and recycling need not be fully exploited.

3.3 Improving the recyclability of products as a prerequisite for material recovery

3.3.1 Recyclability requirements

A recyclable product design is a prerequisite for material recovery. Therefore, an incentive should be created to further encourage the product design to take this aspect into account. In principle, the Ecodesign Directive (Directive 2009/125/EC) makes it possible to define minimum requirements for recyclability in the individual implementing regulations (see Annex I, Part 1, Section 1.3 f) of the Directive. We advocate such stipulations provided there is a sensible interplay between design requirements and recycling practices. Methodological foundations must be developed. The guideline for providing the manufacturer and recycler with information for disposal and the calculation of the recyclability of electrical and electronic equipment[13] is a first approach but requires further improvement for it to be implemented in a regulatory context. This should take place within the framework of the EU Commission's standardisation mandate regarding ecodesign requirements for material efficiency aspects.

3.3.2 Licensing retail packaging dependent on their recyclability

The licensing of retail packaging is another possible link to promote a recyclable product design. The dual systems charge license fees to manufacturers and marketers to finance the collection and disposal of sales packaging waste. These are calculated according to material type and mass, however there is no distinction based on recyclability. Nevertheless, packaging that is compatible with the sorting and recycling process often generates lower sorting and recycling costs and produces higher added value. The resulting financial advantages should be reflected in the license fees of the dual systems in order to create an incentive for an environmentally friendly packaging design. We therefore support consideration of recyclability in the licensing of packaging and similar non-packaging materials. The practical implementation could also be carried out using a fund model in which certain amounts are paid into a fund depending on the mass and type of material (plastic, FE metal, non-ferrous metal, plastic-coated cardboard packaging). Marketers of recycling-friendly packaging would be reimbursed with part of the license fee after material recovery. Fund surpluses should then be used to contribute to the development of recyclable design and communication.

3.3.3 Quality requirements for recyclates regarding environmental and health impacts

Contamination of recyclates in the post-consumer sector can hinder the recycling of plastics. A number of plastic additives (flame retardants, plasticisers, stabilisers) have been identified as problematic in recent years and their use was banned under chemicals legislation – the most important being restrictions by the REACH Regulation and the POP Regulation. Many other substances are also affected by the provisions of the REACH Regulation as so-called "substances of very high concern (SVHC)" and should be replaced.

This can lead to a target conflict between eliminating pollutants by thermal treatment of plastic waste and recycling. This conflict is more relevant if the post-consumer plastic waste is older and thus the pollutant content potentially higher. The objectives that should/can be given priority must be clarified for each individual product group, taking into account the following aspects:

- the type and concentration of the pollutants contained in the used products or the resulting regranulates,
- whether these pollutants are affected by restrictions that do not allow for exceptions (in which case recycling would only be possible to a very limited extent and a recyclate quota would hardly be feasible),
- which product regranulates can be applied easily and how this can be monitored,
- whether there is already a functioning recycling structure worth protecting in this area, or whether the target conflict has so far been a "rather theoretical" problem.
- the effects of the Circular Economy Act's prohibition of mixing

13 IEC/TR 62635 (2012-10) Ed. 1.0

In order to achieve the goal of low-pollutant recycling materials, additional technologies and measures should be developed and promoted to degrade fractions that contain pollutants. Furthermore, there is a need to abandon potential problematic substances in the production of new goods, even if there is no prohibition for them yet (e.g. dispensing with substances with CMR properties[14]).

For the quality assurance of plastic recyclates with regard to existing pollutants, this topic should also be addressed by the relevant standards for plastic recyclates (for example, the EN 15342 et seqq. standard series for plastics – plastic recyclates), which should further include parameters to indicate the pollutant contents as well as methods for their determination.

3.4 Increasing the demand for plastic recyclates

3.4.1 Minimum recyclate quota for plastic products

In addition to increasing the supply of plastic recyclates, it is also necessary to increase their use. One approach to achieve this is the specification of concrete recyclate quotas[15] which must be adhered to in the manufacturing of products. This increases the demand for high-quality secondary plastics and creates an incentive to collect plastic waste more separately than before and to recycle it instead of recovering it energetically. The stipulation of a minimum recyclate quota also guarantees plastic recyclers a verifiable minimum sales volume on the basis of which necessary investments in a high-quality processing infrastructure can be made. Such a quota can thus provide a substantial contribution to the closure of plastic circuits. We therefore propose the introduction of recycling quotas for individual product groups. The quota should relate exclusively to the use of recyclates from product waste in order to raise the still unused potential of recycling post-consumer waste. On the other hand, fulfilling the quota by using recyclates from production waste should be excluded.

In practice, recyclate quotas are already provided by the awarding criteria of the Blue Angel eco-label (RAL UZ 30a “Products from recycled plastics”). This eco-label is voluntary and can be applied for if a plastic product contains at least 80 % post-consumer recyclates. The Blue Angel thus distinguishes particularly ecological products within a product group. Stipulating a minimum recyclate quota would also affect a product group as a whole.

Whether a binding stipulation of recycling quotas is possible at European level only, or at national level as well, is completely dependent on whether the requirements for placing a product group on the market are harmonised in accordance with Union law. National regulation is excluded in the case of harmonisation (e.g. packaging) as long as secondary legislation does not explicitly allow it. For example, national regulations for packaging that could, in principle, be taken into account for a recyclate quota are not currently permitted. In addition, the stipulation of using recyclates is linked to very demanding conditions such as technical feasibility and the availability of recyclates in adequate quantity and quality. Therefore, we consider it necessary to examine a recyclate quota in each individual case with a view to compulsory regulation and self-commitment. An experimental first introduction of a recyclate quota for certain product groups could also help to gain further insights into material streams and recovery paths. Thus, our first proposal is disposable plastic carrier bags and waste and recyclable material containers as pilot examples for a minimum recyclate quota at national level. Naturally, due to the predominantly internationally oriented enterprise and market structures, recyclate quotas should be introduced not only at national level – at least a European concept is necessary in the medium term.

The quota level for the recyclate content in **disposable plastic carrier bags** should be 80 %. This is technically achievable and is already widely practiced by foil and carrier bag manufacturers. It should be borne in mind that the recent amendment to the Packaging Directive[16] allows for market restrictions

14 Substances with CMR properties are carcinogenic, mutagenic or reprotoxic.
15 Recyclate quotas can be designed in various ways. Here we mean the requirement that a certain minimum proportion of the total plastic used in a product must be achieved with the aid of a secondary plastic.
16 Amended by Directive 2015/720/EU.

and a prohibition on placing on the market in derogation from Article 18 of the EU Packaging Directive (Directive 94/62/EC[17]), provided that these restrictions are proportionate and non-discriminatory[18] and are measures taken by the Member States to ensure a permanent reduction in the use of light plastic carrier bags.[19] In addition, Article 6(4)(a) of Directive 94/62/EC obligates Member States, where sensible, to use materials from recycled packaging waste for the manufacturing of packaging and other products by a) promoting the improvement of market conditions for these materials and b) revising existing rules which prohibit the use of such materials. A national regulation that takes account of the EU legal requirements could be included in the further development of the Packaging Ordinance; alternatively, a self-commitment by manufacturers would have to be considered.

For **dustbins**, we also propose a minimum recyclate content of 80 % regarding plastic proportion. Since the technical specifications of mobile waste collection bins are not regulated by an EU directive[20] and there are no harmonised standards[21], additional national requirements are permissible for environmental reasons; the regulation of a recyclate quota would naturally have to affect both domestic and foreign manufacturers equally and maintain proportionality.[22] Technical requirements are set out in the Standard DIN EN 840 sheets 1 to 6. Also these do not prevent the use of recyclates as long as the described requirements are met.[23] A national regulation could be developed as a separate law or regulation based on §24(3) in conjunction with §23(2)(2) of the Circular Economy Act[24]; alternatively a self-commitment by manufacturers could be considered.

Currently there is insufficient information regarding construction products to justify a recyclate quota for a particular product. For this purpose the actual plastic composition in the waste stream, including pollutant loads, fillers and other additives, production quantities and quality requirements of the product, must all be known in order to determine both the feasibility and steering impact of such a proposal. One of UBA's tasks for the near future is to evaluate the effect of increasing pollutant regulations on existing recycling processes: it must, in particular, highlight the established recycling of **PVC windows** which could create a target conflict between pollutant elimination (heavy metal containing stabilisers) and plastic recycling and impair recycling due to the legal requirements (see Section 3.13).

3.4.2 Ecodesign Directive requirements for recyclate use

In principle, it is possible to stipulate a minimum proportion of plastic recyclate in implementation regulations within the framework of the Ecodesign Directive. For such requirements, it must be ensured that there is sufficient starting material mass, that environmental and health aspects – such as the dangers of accumulating pollutants in recycling cycles and products – are taken into account and that verifiability via market surveillance authorities is guaranteed. The principle of equal treatment must also be taken into account, which means that similar products must be affected equally. We support the stipulation that a minimum proportion of plastic recyclates should be considered in future. In view of the above mentioned restrictive requirements, a self-regulatory initiative within the Ecodesign Directive with a cross-sectoral recyclate use quota could provide the necessary flexibility and easier verifiability compared to product-specific requirements in implementation regulations.

3.4.3 Further development of the Blue Angel

The use of plastic recyclates has played an important role in the "Blue Angel" eco label for years. The most prominent example is the RAL UZ 30a for products made of at least 80 percent post-consumer recycled plastics (this includes for example, office supplies, waste bags and carrier bags). Promoting the use of

17 European Parliament and Council Directive 94/62/EC of 20.12.1994 on packaging and packaging waste (OJ L 365 of 31.12.1994, p. 10), last amended by Directive 2015/720/EU of 29.04.2015 (OJ L 115 of 6.5.2015, p. 11).
18 Directive 94/62/EC Article 4(1a)(2).
19 Directive 94/62/EC Article 4(1a)(1).
20 See DIN EN 840-1 Annex C.
21 See http://ec.europa.eu/growth/single-market/european-standards/harmonised-standards/index_en.htm
22 Generally ECJ judgement of 14.12.2004 – C-309/02 "Radlberger Getränkegesellschaft mbH & Co., S. Spitz KG v. Land Baden-Württemberg", No. 75, 79.
23 DIN EN 840-1, 840-2, 840-3, 840-4 and No. 9.2 explicitly outline this.
24 See Tünnesen-Harmes, in: Jarass/Petersen, Circular Economy Act Commentary, §23 marginal no. 35: „A statutory authorisation to ascertain the above-mentioned provisions can be found in §24(3), according to which, certain products may be placed on the market only in certain ways which are significantly beneficial to waste disposal'. Reusing recyclable waste or secondary raw materials unburdens waste disposal. In addition, it would also be possible to support a legal ordinance to ascertain the above-mentioned obligations on the product design obligation regulated in §24(1).".

post-consumer recyclates in the "Blue Angel" eco label should be further developed in the medium to long term. It is essential that the use of post-consumer recyclates is ensured and documented transparently and that the entire processing chain is certified.

In addition to the use of recycled plastics, the theme of recyclability should also be given greater consideration when awarding the Blue Angel. In order to better recycle plastic packaging, no potential pollutants and incompatible materials should be used that might render separation or reprocessing decidedly more difficult or reduce the quality of the recyclate. As an example, requirements for packaging design should also be included in the award criteria for washing powder, cleaning products and dishwashing liquids in addition to the stipulations for the actual product.

3.4.4 Increasing the demand for recycled products through public procurement

For the consideration of environmental requirements within the framework of public procurements, only facultative provisions exist aside from a few exceptions. Pursuant to §45 of the Circular Economy Act, federal authorities are obliged to verify, particularly in the case of procurement, whether and to what extent products can be used:

- that are characterised by longevity, repairability and reusability or recyclability,
- that lead to less waste or less polluted waste than other products, or
- that have been manufactured by processing for re-use or recycled from waste.

The guidelines and recommendations for environmentally friendly public procurement published by the German Environment Agency are very much in line with the award criteria of the Blue Angel eco label (see Section 3.8). Criteria for strengthening recycled products are taken up in the procurement recommendations of the German Environment Agency if the eco label also demands them.

3.4.5 Increasing recyclate demand in the context of sustainable construction

The construction sector is the second most important application sector of plastic products.[25] Sustainable construction initiatives – whether through public or private constructors – differentiate the products on the market based on different ecological qualities and subsequently set varying product requirements depending on the desired building quality. For this purpose, reference is made to previously established criteria, e.g. eco labelled construction products[26] or timber from certified plantations. Accordingly, a (product-specific) requirement for construction products with regard to the recyclate proportion can only be made if there are products on the market which disclose the recyclate proportion directly, or if this information is easily obtainable from the manufacturers. Generally speaking there are no such conditions yet, which is why architects or planners can hardly implement this requirement at the moment. Furthermore, sometimes the use of recyclates is not disclosed directly but is positively reflected in life cycle assessment values and the product is subsequently advertised using life cycle assessment indicators. Fearing a negative image or the desire to avoid price drops due to the use of recyclates may be reasons for not disclosing recyclate contents. The assessment system for sustainable building (BNB) also uses life cycle data of the installed products for evaluating buildings and thus takes recycling into account indirectly. We are exchanging information with the Federal Institute for Research on Building, Urban Affairs and Spatial Development (BBSR) on ways in which the underlying assessment methodology of the BNB system can be further improved to take even greater account of recycling issues. As a member of the Institute for Building and Environment (IBU) council of experts, UBA also supports the further development of significant environmental product declarations for construction products.

25 Approximately 24 % of plastic products are used in construction with PVC accounting for the majority at 40 % (Consultic 2014).
26 Products made of PVC cannot be awarded an eco label because this has so far always been rejected by the eco label jury

3.4.6 Promotion campaign for recycled products – raising consumer awareness and sensibility

Increasing the recyclate content in products depends not only on the availability and quality of the recyclate, but also on the demand for such products. This demand is driven by informed consumers who make a conscious decision to purchase these products or who value the use of recyclate as a positive contribution to environmental protection. A campaign can strengthen acceptance and demand for products containing plastic recyclates. It is particularly important that the campaign focuses on products that are closely linked to the everyday life of consumers. Such a campaign should be developed based on the UBA Consumer Portal[27] and the Blue Angel activities[28].

3.5 Promotion within the framework of the environmental innovation programme

The environmental innovation programme promotes investments in the first-time, large-scale application of environmentally friendly technologies. The aim of this top-level funding programme is to encourage novel methods or process combinations that support state of the art technologies in their entry into the market. Several projects have already been promoted in the plastics industry in recent years. Further potential for technological development can be exploited by the fact that UBA initiates sector dialogue and provides information about promotion possibilities. We want to achieve ambitious promotion of plastic recycling by establishing a relevant focal point with accompanying specialist activities and events.

27 See: http://www.umweltbundesamt.de/themen/wirtschaft-konsum/umweltbewusstleben
28 See: https://www.blauer-engel.de/en

4 Summary

There is a need to strengthen the recycling of plastic waste in order to conserve resources and reduce CO_2 emissions. The German Environment Agency proposes measures to ensure that plastic waste undergoes high-quality material recovery in the form of a cascade utilisation and is only recovered for energy when this is no longer possible. In our opinion, supporting a plastic recycling economy requires the following essential prerequisites:

- consistent separation of plastic-containing waste (for example, amendment of the Commercial Waste Ordinance)
- collecting similar non-packaging materials from households in a recycling bin
- ambitious, plastic-specific recycling quotas
- environmentally friendly and recyclable product design
- recyclability-dependent license fees for packaging
- increased use of recyclates in products (minimum recyclate quotas)
- requirements for public procurement regarding the use of recyclate-containing products

5 References

Bünemann, A.; Rachut, G.; Christiani, J.; Langen, M.; Wolters, J. (2011): Business game for further developing the Packaging Ordinance. Subproject 1: Determining the ideal composition of recycling bins. UFOPLAN (Environmental Research Plan) project, FKZ 3710 93 313 1. UBA texts 08/2011. http://www.umweltbundesamt.de/publikationen/planspiel-zur-fortentwicklung-verpackungsverordnung

Consultic (2014): Production, processing and recycling of plastics in Germany in 2013. Consultic Marketing & Industrieberatung GmbH, Alzenau. http://www.plasticseurope.de/Document/studie-zu-produktion-verarbeitung-und-verwertung-von-kunststoffen-in-deutschland-2013---kurzfassung.aspx?Page=DOCUMENT&FolID=2 (Summary)

Dehne, I.; Oetjen-Dehne, R.; Siegmund, N.; Dehoust, G.; Möck, A. (2014): Material stream-oriented solutions for high-quality recovery of mixed commercial municipal waste. UFOPLAN (Environmental Research Plan) project, FKZ 3712 93 312. UBA texts 18/2015. http://www.umweltbundesamt.de/publikationen/stoffstromorientierte-loesungsansaetze-fuer-eine

Dehne, I.; Oetjen-Dehne, R.; Kanthak, M. (2011): Occurrence, continuance and resource relevance of commercial wastes. UFOPLAN (Environmental Research Plan) project, FKZ 3709 33 314. UBA texts 19/2011. http://www.umweltbundesamt.de/publikationen/aufkommen-verbleib-ressourcenrelevanz-von

Dehoust, G.; Christiani, J. (2012): Analysis and development of recycling rates for recyclable materials – collection and recycling rates for packaging and similar non-packaging materials as a control instrument for resource conservation. UFOPLAN (Environmental Research Plan) project, FKZ 3711 33 316. UBA texts 40/2012. http://www.umweltbundesamt.de/publikationen/analyse-fortentwicklung-verwertungsquoten-fuer

Wengenroth, K. (2015): Importance of RDF preparation in light of the amendment to the Commercial Waste Ordinance. VDI Knowledge Forum Thermal Waste Treatment, 1st/2nd October 2015, Würzburg

Wilts, H.; Gries, N. von; Dehne, I.; Oetjen-Dehne, R.; Buschow, N.; Sanden, J. (2014): Developing measures and tools to increase the use of secondary raw materials – with a focus on secondary plastics. UFOPLAN (Environmental Research Plan) project, FKZ 3712 33 340. https://www.umweltbundesamt.de/publikationen/entwicklung-von-instrumenten-massnahmen-zur

Zangl, Stéphanie; Blepp, Markus; Marquardt, Maurice; Moch, Katja; Wirth, Olaf; Homburg, Burkhard; Temme, Christian (2012): National implementation of the Stockholm Convention on persistent organic pollutants (POPs) – PBDE and PFOS in products and recycling circuits. UFOPLAN (Environmental Research Plan) project, FKZ 3710 63 415. http://www.bmub.bund.de/fileadmin/Daten_BMU/Pools/Forschungsdatenbank/3710_63_415_stockholm_bf.pdf

▸ **Publications as a pdf:**
www.umweltbundesamt.de/publikationen

www.facebook.com/umweltbundesamt.de
www.twitter.com/umweltbundesamt